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| EXAMINER | |
|---|---|
| CREPEAU, JONATHAN | |
| ART UNIT | PAPER NUMBER |
| 1746 | |

DATE MAILED: 03/31/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/917,630 | SUDA, SEIJIRAU | |
| | Examiner | Art Unit | |
| | Jonathan S. Crepeau | 1746 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *14 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. This Office action addresses claims 1-14. Applicant's argument regarding the term "fluorinated" is persuasive and as such, the claims are newly rejected under 35 USC §103 herein. Accordingly, this action is non-final.

### *Claim Rejections - 35 USC § 103*

2. Claims 1-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (U.S. Patent 5,599,640) in view of Sawa et al (U.S. Patent 6,030,724).

Regarding claim 1, Lee et al. is directed to an alkaline fuel cell comprising a negative electrode, a positive electrode, and an electrolyte solution (see abstract). Regarding claims 1 and 5, the electrolyte solution comprises KOH or NaOH at a pH greater than 7. Regarding claim 6, this range of pH is anticipatory of the claimed range of alkali metal hydroxide in solution (5-30 wt%) because solutions having a pH between 7 and 14 contain weight percentages of alkali metal hydroxide which encompass the claimed range. Regarding claims 1, 3, and 4, the electrolyte further comprises a metal-hydrogen complex capable of generating hydrogen ions, such as potassium borohydride, sodium borohydride or lithium aluminohydride (see abstract). Regarding claim 7, the amount of metal-hydrogen complex in the electrolyte solution is 0.01-50 wt% (see col. 4, line 13). Regarding claims 1 and 8, an oxygen source such as air or pure oxygen is connected to the cathode (see col. 5, line 57). Regarding claims 1 and 10, a separator

(permeable membrane) functioning as an ion conductor is present between the electrodes (see col. 4, lines 45-48). Regarding claim 10, the disclosure of an "ion conductor" is considered to be anticipatory of a cation exchange membrane and an anion exchange membrane. Regarding claim 1, the negative electrode contains a hydrogen storage alloy (see col. 4, lines 34-44). Regarding claim 2, the alloy may have a composition of $Zr_{1-x}Ti_xCr_{1-Y-Z-A-B}Mn_YFe_ZCo_AV_BNi$ (see column 4, line 40). This formula reduces to $Zr_{0.6}Ti_{0.4}Cr_{0.5}Mn_{0.5}Ni$ when X=0.4, Y=0.5, Z=0, A=0, and B=0.

Lee et al. do not expressly teach the same alloy subscripts as recited in claim 2, i.e., a $Zr_{0.5}Ti_{0.5}Cr_{0.5}Mn_{0.5}Ni$ alloy. Further, the reference does not expressly teach that the hydrogen absorbing alloy is fluorinated, as recited in claim 1.

However, regarding the alloy of claim 2, a person of ordinary skill in the art may reasonably expect that a $Zr_{0.5}Ti_{0.5}Cr_{0.5}Mn_{0.5}Ni$ material and a $Zr_{0.6}Ti_{0.4}Cr_{0.5}Mn_{0.5}Ni$ material would have the same hydrogen-absorbing properties. A *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. See *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985); MPEP §2144.05(I).

Furthermore, the patent of Sawa et al. is directed to a hydrogen storage alloy and a secondary battery using the same (see abstract). In column 4, line 21, the reference teaches that the alloy may be subjected to a fluorinating treatment.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan

would be motivated to apply the fluorinating treatment of Sawa et al. to the hydrogen storage alloy of Lee et al. In column 4, line 17, Sawa et al. teach that "[t]he comminution and deterioration of the produced hydrogen-storage alloy by the absorption and release of hydrogen can be curbed by subjecting this alloy to [...] a fluorinating treatment." Accordingly, the artisan would be sufficiently motivated to apply the fluorinating treatment of Sawa et al. to the hydrogen storage alloy of Lee et al, thereby rendering the claimed subject matter obvious.

3. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Sawa et al. as applied to claims 1-8 and 10 above, and further in view of Narayanan et al (U.S. Patent 6,485,851).

Lee et al. does not expressly teach that the oxygen source is an aqueous solution of a water-soluble oxidizing compound, as recited in claim 9.

Narayanan et al. is directed to a liquid fuel cell. In Example 1, the reference teaches that the oxygen source is an aqueous solution of hydrogen peroxide.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of Narayanan et al. to use aqueous hydrogen peroxide as the oxygen source of Lee et al. In column 1, line 62, Narayanan et al. disclose the following:

> However, there still exists a need for an organic fuel cell capable of using an alternative oxygen source. In some fuel cell applications, air is absent or available in only limited quantities. For example, submarines and other underwater applications have little to no oxygen available for fuel consumption. Low noise signature, high volume and high specific energy density are also desirable for such underwater applications. High energy fuel cells based on pure compressed hydrogen and oxygen gas are disadvantageous for several reasons. The compressed tanks present safety concerns. The compressed tanks are also heavy and take up a lot of space which are impracticable or undesirable for some applications. Such cells also present other environmental and safety problems.

Thus, the artisan would be sufficiently motivated by this disclosure to use aqueous hydrogen peroxide as the oxygen source of Lee et al.

4. Claims 11-14 rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Sawa et al. as applied to claims 1-8 and 10 above, and further in view of Wang et al (*J. Alloys and Compounds*, 1999).

Lee et al. do not expressly teach that the negative electrode comprises a substrate plate and a 50-300 micron-thick cladding layer containing the hydrogen-absorbing alloy, as recited in claims 11 and 12, or the thickness of the fluorinated alloy surface layer, as recited in claim 14.

However, regarding claim 14, the artisan would possess sufficient skill to manipulate the fluorine layer thickness on the alloy surface so as to fall within the claimed range of 0.01 to 1 micron. As set forth above, Sawa et al. teaches that the fluorinating treatment provides the alloy with resistance to degradation. The content and/or thickness of the fluorine layer may be

routinely manipulated by a skilled artisan so as to affect the degree of such degradation resistance. Generally, the artisan would be motivated to use as thin a layer as possible so as to not adversely affect the other electrochemical characteristics of the alloy. It has been held that the discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980). Thus, the range recited in claim 14 is not considered to distinguish over the references.

Additionally, the publication of Wang et al. is directed to an alkaline fuel cell employing a hydrogen absorbing alloy negative electrode. In Figure 2, the reference teaches that the negative electrode is comprised of a foamed nickel substrate, a catalyst (cladding) layer on the substrate, and a waterproof layer on top of the cladding layer. The cladding layer has a thickness of 250 microns and the waterproof layer has a thickness of 200 microns (see page 835, third full paragraph).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the negative electrode structure of Wang et al. in the fuel cell of Lee et al. In section 3.5, Wang et al. teach that it is important that the anode has a long lifetime (550 h). Further, the substrate would improve the structural integrity of the electrode, and the waterproof layer would help to prevent flooding of the electrode. Thus, the artisan would be motivated to use the anode structure of Wang et al. in the fuel cell of Lee et al.

***Conclusion***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached at (571) 272-1302. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (703) 872-9306.

Jonathan Crepeau
Patent Examiner
Art Unit 1746
March 24, 2004